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ABSTRACT

The symbolic representational block constructions of twenty 4-year-olds and twenty 7-year-olds were analyzed from Werner and Kaplan's (1963) theoretical perspective. Each child was read a story and then asked to use the blocks to represent the story. Older children included in their representations a larger number of features that were central to the story. The older children's representations also consisted of story-relevant materials, while the younger children included irrelevant material. The younger children's block representations were structurally more global and diffuse. Findings are discussed in terms of the theoretical relationship of representation to a given referent and of early concept development. (Author/MP)

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The Development of Symbolic Representation: The Case of Building Blocks

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Abstract

The symbolic representational block constructions of 20 4-year-olds and 20 7-year-olds were analyzed from Werner and Kaplan's (1963) theoretical perspective. Each child was individually read a story, then was asked to use the blocks to show the story. Older children included a larger number of features in their representations that are central to the story. A larger significantly proportion of the older children's representations consisted of story relevant material, while younger children included material that was irrelevant to the story (e.g., ladder, radio, cars). The younger children's block representations were structurally more global and diffuse. Findings are discussed in terms of the theoretical relationship of representation to a given referent and of early concept development.

The Development of Symbolic Representation: The Case of Building Blocks

Stuart Reifel, The University of Texas at Austin

Symbolic representation, or the ability to create and use symbols, is central to the human capacity to think and to express thought. It includes any of the methods humans use to express the activities of their minds. A person with a given mental state (i.e., thoughts and feelings) selects some method for depicting that mental state. For example, when a child constructs a house or a road out of building blocks, knowledge of a house or a road is being represented. According to Werner and Kaplan (1963), the ability to represent becomes more differentiated and integrated as the person matures. Current theoretical and empirical work has called attention to the need to understand more about children's increasing abilities to use representational media such as drawing (Gardner, 1980; Goodnow, 1977), gesture (Barten, 1979), language (Anglin, 1979; Bates, 1979), and play (Fein and Apfel, 1979). One author has called for defining "the nature of competences in specific symbol systems," including the steps involved in making use of any number of symbolic media (Gardner, 1979). We have, as yet, little knowledge about the nature of the representational media that children are exposed to or about their developing abilities with those media.

Building blocks are a representational material that is commonly found in early childhood education programs. The purpose of this study was to describe the development of representational block use, using the theoretical perspective articulated by Werner and Kaplan (1963). Those authors present

a framework for symbolic representation that includes relationships between the organism and a cognitive object (i.e. a referent), between the organism and a symbolic vehicle (i.e. the signifier), between the cognitive object and the symbolic vehicle, and between the organism and an addressee (i.e. an observer or listener). This study contributes to our knowledge of one representational medium that children are commonly exposed to in early childhood programs. The focus is on the development of the use of one symbolic vehicle with regard to a given referent.

The literature on block use by children has recognized the representational attributes of block play. Several studies document instances of children labeling or naming their block constructions, giving them representational meaning (Bailey, 1933; Gesell and Ilg, 1946; Hartley, Frank and Goldenson, 1952; Hartley and Goldenson, 1963; Robinson, 1958). Some authors simply listed the names children give block constructions, either in classrooms (Hartley et al, 1952) or in experimental sessions (Bailey, 1933; Robinson, 1958). A child's designation of a construction as a house or as a road is documented as such.

The psychoanalytic literature adds additional interpretation to children's representational block constructions. Erikson (1951, 1963) describes many cases of children who create (i.e. represent) scenes with blocks and other toys. Erikson has interpreted the forms of these representations as reflecting sex-role morphology and cultural roles; boys represent phallic towers and social settings from the work-world, while girls represent internal space and home scenes. These interpretations of block constructions recognize a manifest meaning for block constructions (e.g. house, tower, building), but also interpret the structure in terms of underlying psychological motivations (such as need for power, fear, control, release, and

so on).

In all of these studies, an observer has documented the child's labels for block constructions, then has gone on to address non-representational attributes of play (e.g. use of space, motivational correlates). It seems possible to conclude that children do use blocks representationally, although we have little descriptive data on the form, content, or development of such representations.

Schuster (1973) attempted to control the object of representation by having two age groups of children (ages 5-7 and 9-11) construct a tower, a house, and another structure of their own choice. In the structured construction situation, when children built houses and towers, the author found no age or sex differences in the structures. All children demonstrated a "reality based building style," reflecting what from an adult's view seem to be the actual characteristics of houses and towers. Given our interest in the use of blocks to represent a referent, this study provides some insight into the child's representation of a specified object (house, tower).

From his observations, Piaget (1962) documents children's "brick" (i.e. block) representations of houses and other objects. E.g.,

> . . .using interlocking bricks and rods she built a big house, a stable and a woodshed, surrounded by a garden, with paths and avenues. Her dolls continually walked about and held conversations but she also took care that the material constructions should be exact and true to life. (p. 137)

He relates such behavior to the semiotic function and discusses how representations reflect the child's differentiation of the signifier (the block construction) and the signified (the house, woodshed, path, etc.)

In Young Geographers (Mitchell, 1963) and I Learn From Children (Pratt, 1948), the authors demonstrated representational uses of blocks

with cases of children's classroom experiences. Blocks, and other constructional materials, were used by children to recreate their experiences on field trips. Photographs demonstrate groups of children reconstructing in their classrooms a harbor and a section of the city they had visited (Mitchell, 1963). The relationship of representational constructions to previous objective experience is clear from those photos.

Clearly, these studies contribute little to our knowledge about the development of representational block use. No studies have documented the form, content, or interpretation of block representation; it is not clear when or in what manner block representations become accessible, "public" symbols, understandable to adults or to other children.

As stated above, Werner and Kaplan (1963) provide the theoretical framework that has guided this study. Representation involves relationships between a person, a referential object, a symbolic vehicle, and an addressee. Each of these relationships undergoes development, from phases of globality and undifferentiation to phases of increasing differentiation and hierarchic integration (Werner, 1957). The content or meanings of the block representations, that is the manner in which the representation relates to the referent, can be described as transforming from a state of syncretism (i.e. many referents are blended together) to a condition of being discrete (i.e. a referent is a differentiated whole). Younger children are more likely to include content in their representations that can be seen as extraneous to a referential object, in contrast to older children who are more likely to include content that is pertinent to the referential object. The meanings of older children's representations will discretely reflect a referential object, with represented parts relating to the referential whole.

In addition to the content of representations, the structural

attributes of representations are a relevant dimension for analysis. The representations of young children tend to be global, with parts being diffuse and indistinguishable from one another; for example, block houses may not look like houses at all. Older children can articulate their representations so that the referents that are represented can be distinguished by an observer; any represented object will, according to adult perspective, denote its referent.

Methodology

Data for this cross-sectional developmental study were collected from a sample of 40 children from a laboratory school. There were 20 4-year-olds and 20 7-year-olds, with an equal number of boys and girls in each age group. Various ethnic groups were represented in the stratified random sample. Many of the children's parents are professionals, but some of the school population is on scholarship, indicating some socio-economic diversity. All children came from homes where English is the spoken language.

Each child was taken to an experimental room where the following equipment was arranged: a table and chairs for the child and the experimentor, a box of table-top building blocks on the table, a video-recorder (focused on the table), a tape-recorder, and various recording forms. A female research assistant sat across the room to record child speech and reactions.

The child was invited to play with the blocks while answering questions about prior experience with block play. After returning the blocks to the box, the child was directed to listen closely to the story of Little Red Cap (Grimm [1972] version of Little Red Riding Hood). At the end of the story, the child was directed, "Use the blocks to show me the story of Little Red Cap. You can use the blocks any way you like to show me the story we just read." The video-tape recorder was activated, the child constructed, then

the child was asked to describe in detail what the blocks showed. The research assistant recorded the responses. The video-recorder was stopped. After the child was escorted back to the classroom, a set of photos was taken of all block representations.

Two judges listed each child's labels for block structures (i.e., the description of content) from the end-of-session description of block constructions; judges agreed on 97% of all labels. The first measure relating to representation calculates the degree to which story content is shown by 4-year-olds and 7-year-olds. A point score was computed for each child. One point was given for inclusion of each of the following child denoted story features: Little Red Cap, the mother, the wolf, the grandmother, the huntsman, Little Red Cap's house, the path, the woods, flowers, Grandmother's house, Grandmother's bed. All of these features are specifically mentioned in the story and are significant in the story. The average number of points for 4-year-olds ($M = 1.45$) is significantly less than the average number of points for 7-year-olds ($M = 4.60$; $t = 5.52$, two-tailed test, $df = 38$; $p < .001$). Older children represent proportionally more of the story's basic content.

The children's total representational use of blocks is the primary focus of this study. It is important to look at not only block representations related to the story but at each child's entire use of blocks. This form of analysis is pertinent to our interest in the way block representations reflect the child's total mental functioning, with regard to the story-as-referent and whatever else is occupying the mind.

In the second measure for analysis, each child was assigned a score equal to the proportion of story content (e.g., houses, characters, etc.) to his or her total number of labels. This shows proportionally what part the referent has in the total block representation. The mean proportions for

the 20 younger children (M = 23.9) and for the 20 older children (M = 56.0) proved to be significantly different ($t = 5.07$, $p < .001$, $df = 38$, two-tailed test). The older children's representations consist of proportionally more story content than younger children's do; more of younger children's representations show material that is irrelevant to the story, e.g., ladders, radios, comper-vans, flag poles.

The third measure for analysis looks at diffuse-articulated aspects of block representation, i.e., the distinguishability of block structures, and was analyzed by having three judges attempt to distinguish each labeled representation from photographs. Two out of three judges agreed on 99% of the judgments. As with the earlier analysis, each child was assigned a score equal to the proportion of distinguishable block structures compared to his or her total number of representational structures. The mean proportion of distinguishable structures for younger children (M = 45.0) was significantly lower than the proportion for older children (M = 91.0; $t = 4.87$; $p < .001$, $df = 38$, two-tailed test). Older children construct block representations that are more accessible to an addressee than do younger children.

A look at sex as a variable within this dimension reveals that for 4-year-olds only, boys produce distinguishable structures at a higher proportion than do girls. A comparison of the means for 4-year-old girls (M = 26.6) and boys (M = 63.4) is significant at the 0.05 level ($t = 2.28$, $df = 18$, two-tailed test). The block representations of 4-year-old boys are relatively more distinguishable than those of girls of the same age.

To clarify exactly what children did with the blocks, a sample of photos of their block representations is appended. The first three photos show 7-year-olds' constructions. Figure 1 shows the setting for the story, including from the left Little Red Cap's house, the path, trees, a stack of

cut logs, flowers, and the grandmother's house. Figure 2 shows, from the left, Little Red Cap's house, the path, grandmother's house (the double arch in the center), the path continuing with road signs, a bridge, and the village. Figure 3 shows the two houses, the path, and the story's five characters lined up in a row.

In contrast are three photos of 4-year-olds' constructions. Figure 4 shows the grandmother's bed (with a pillow) on the path, the woods, a door, two cars, a gate, gas (for the car), "where the books go," and a ladder. Figure 5 shows Little Red Cap's house, with two chairs inside (one for her and one for her mother). Figure 6 is the grandmother's house, with a bed, camper-van, two chairs, three bathrooms, a car, a place to park the car, and "another place to go to bed."

Discussion

The age differences reported above are significant in a number of ways. With regard to the content of block representations, it is not surprising that older children represent a greater number of story features. We know that older children have better memory for stories (Mandler, 1978; Stein, 1979), so it is more likely that they are able to draw on their better memories in order to represent. What is informative is the nature of the representations at the two age levels and how those representations appear to transform as children develop.

A number of practical considerations contribute to the delimitation of this study. Data were collected at a laboratory school, so findings cannot be generalized beyond the children described above. Within the school, both 4- and 7-year-olds had access to building blocks in their classroom, but observations there suggest that boys may have had more practical experience with blocks; children's performance in the study may have been influenced

by their degree of previous practice with the materials. Finally, children's description of block representations is verbal, so the findings from this study are dependent on the language skills of the children.

Younger children's block representations show the story-as-referent combined with all sorts of other referents, reflecting what Werner (1957) has called syncretic thought. Camper-vans and three bathrooms and cars are included in a grandmother's house, when no such things are a part of the story. Ladders, flag-poles, gasoline, radios, and rainbows appear in the younger children's block play, in most cases combined with features of the story. Older children's representations are significantly more focused on the story; they are discrete. This transformation in representations from syncretic to discrete validates Werner's theoretical description of mental development. The theory provides one way of viewing younger children's mental abilities that does not characterize them in terms of deficiencies or in terms of what they lack.

The larger proportion of block representation that is focused on the story-referent by older children appears to indicate an increasing ability of children to differentiate specific referents from other experience. For younger children, the referent is mentally blended with diverse other experience, at least as reflected in their representations. The ability of 7-year-olds to keep the referent more discrete is possibly due to better memory processes such as inference (Paris, 1978) or internal rehearsal (Flavell, 1977). For younger children, a given referent may trigger any number of ideosyncratic associations that can lead to representations of radios, camper-vans, or flag poles. More work should be done exploring the diverse referents for content in children's representations and the mental processes that deal with that content at different ages.

With regard to the structural distinguishability of the block representations, findings from this study support Werner's description wherein younger children's representations are diffusely organized (and, as can be seen from the figures, formed in global masses) while older children articulate the parts within the total representation. Older children's representations are more differentiated, in terms of the parts included and of the spatial arrangement of parts.

The sex difference in distinguishability of structure for 4-year-olds only is difficult to explain, although it is possible that the younger girls in this study did not have as much experience with blocks as did the boys. If that is the case, it is difficult to understand how the older girls were able to catch up with the boys by age seven. It is possible that by age seven children of both sexes have reached a ceiling or plateau in their skills with blocks. It is worth exploring the possibility that children will take differing developmental routes in order to attain the same end. This is an interpretation that is consistent with Werner's theory.

The undifferentiated treatment of content by younger children appears to parallel their relatively undifferentiated articulation of structure in representations. This leads to a number of questions regarding younger children's understanding of a given referent and their abilities to use materials like blocks to represent that understanding. Can children differentiate more parts of a referent than they are able to show with a given material? A recent analysis of block symbols (e.g., block houses, block paths) has shown that for certain constructions, older children differentiate more parts structurally (including block parts in the block whole) and verbally (by labeling parts of the whole) in their representations (Reifel and Greenfield, in press). Older children do seem to have

more knowledge of the referent, but they also have greater skills in arranging blocks in more complex configurations (Guanella, 1935; Johnson, 1974; Vereeken, 1961). More must be done to elaborate the relationship between the structure of a referent, the structural potential of representational media, and children's increasing abilities with the media. This work is necessary in order to determine whether representational skills are limited by lack of comprehension of the referent by the child (possibly related to what Piaget [1962] has called syncretic perception of the referent) or whether it is a lack of skills with the representational medium that is limiting the child's ability to express all that is known.

In conclusion, representation of a given referent with building blocks can be described as undifferentiated for younger children (a referent contributes little to the content of representation) and diffuse structurally. Older children focus significantly more on the referent in their representations, and their representations are well-articulated formally. These findings support Werner's view of symbol development.

Age differences in representation suggest a number of questions regarding the child's comprehension of referents, the use of representational materials, and the appropriateness of different representational materials for demonstrating knowledge.

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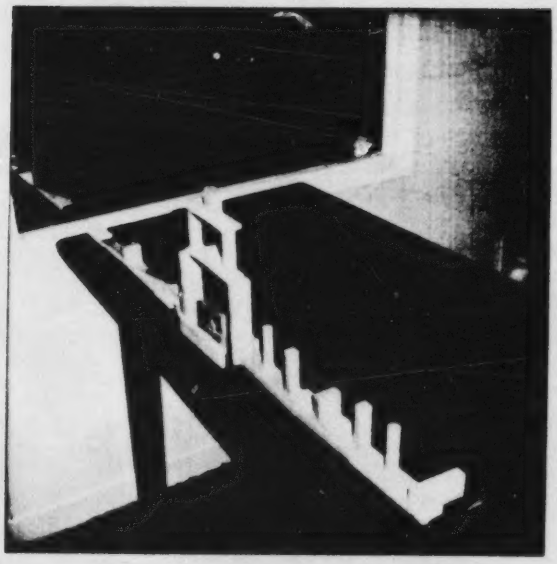
187305 1

Figure 1.

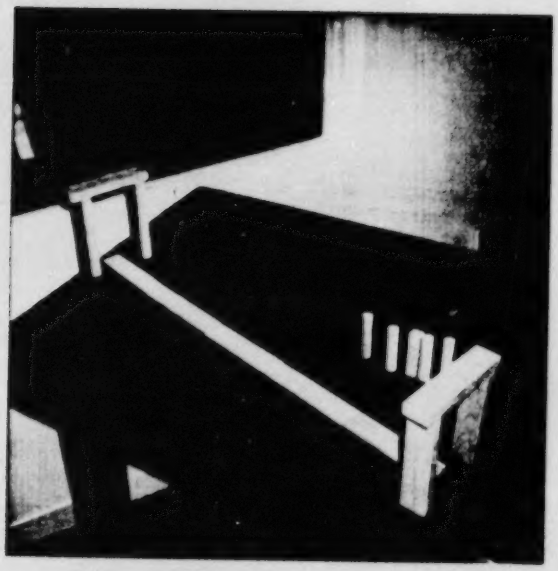
From the left, Little Red Cap's house, the path, the woods, a stack of cut logs, flowers, Grandmother's house.



292305 2

Figure 2.

From the left, Little Red Cap's house, the path, Grandmother's house, the path continuing, road signs, a bridge, the village.



187319

Figure 3.

Representation of Subject #187319 (boy, age 7).

Houses, path, and the five story characters.

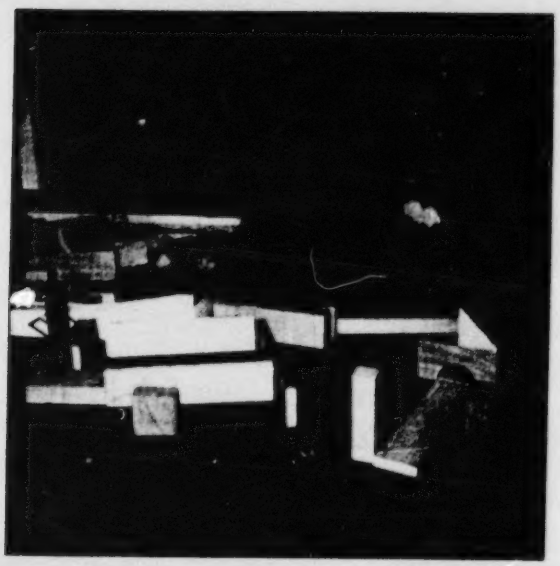


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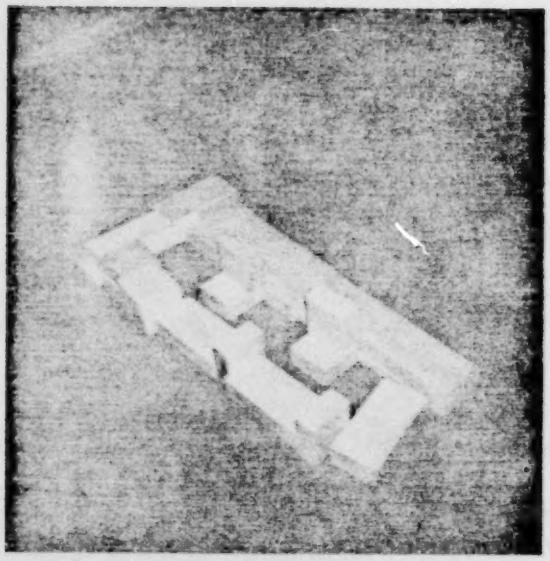
Figure 4.

Grandmother's bed, with a pillow, the path, the woods, a door, two cars, a gate, gas (for the car), "where the books go," and a ladder (for the books).

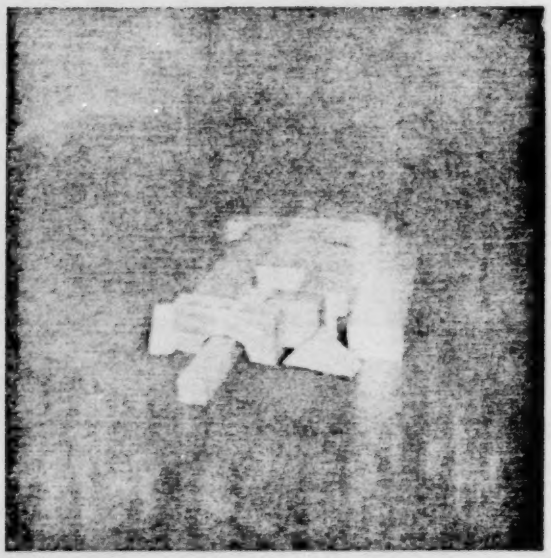


157106 1

Figure 5.

Representation of Subject #157106 (boy, age 4).

Little Red Cap's house with 2 chairs.



258103 1.

Figure 6.

Grandmother's house, with a bed, camper-van, two chairs, three bathrooms, a car, a place to park the car, and another place to go to bed.